

The automation of technological processes for creating small-scale digital cartographic bases for general geographic and thematic mapping

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Abstract. In the article we present the methodology of automated creating small-scale digital cartographic bases for general geographic and thematic mapping.

Keywords: mathematical bases, digital cartographic base, cartographic database, generalization.

1. Introduction

The increasing demand for diverse and qualitative cartographic production can be satisfied by the automation of the technological processes of creating and using maps. First of all, we talk about both general geographic and topographic maps, which besides their common use, can be used as a cartographic base in thematic and atlas mapping. Small-scale general geographic maps don't have strict regulations. This fact prevents from using them as basic materials and creating new digital maps. Besides the increasing level of a generalization and the reduction of the map's scale reduces the accuracy of position of mapping objects, and it also prevents their use for the creation of digital maps.

The system for office geoinformational mapping, solution to the problem of the automation of cartographical processes on the base of compiling, transforming and using cartographical data base was developed in the Moscow State University of Geodesy and Cartography under the scientific supervision of Prof. Dr. of Technical Science, Ivanov A. G.

Direct formation of any database, including mapping, is a time-consuming and unprofitable process. Therefore, it is expedient to create mapping data-bases in the process of cartographic products creation. Cartographic basics, which are currently widely used in the thematic and atlas mapping, can be used as such products. The digital mapping basics include the borders, the elements of hydrography, settlements, and transport ways.

2. Technology for creating digital base maps

Technological scheme of creating digital base maps is presented in Figure 1

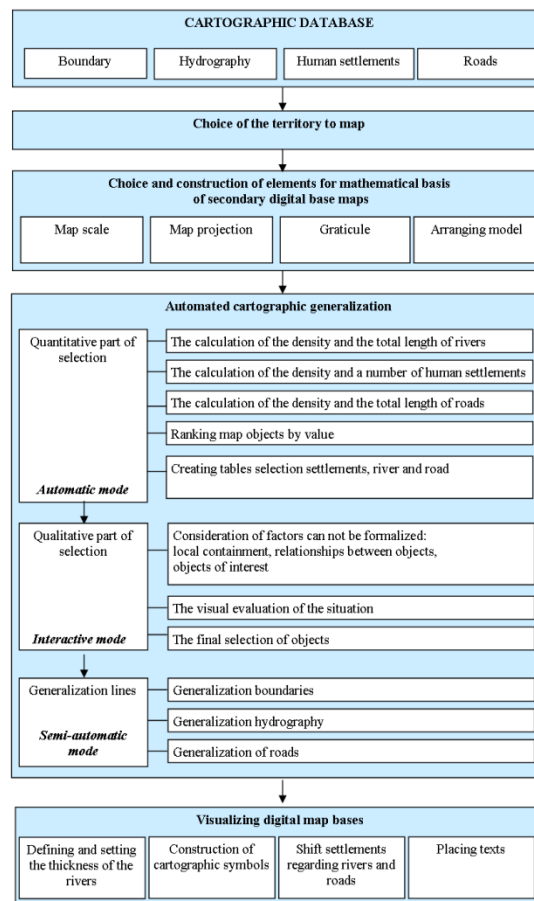


Figure 1. Technological scheme of creating digital base maps

Conversion of the content of cartographic database is for the purpose of mapping a set of mathematical and cartographic basis.

Despite that there is a developed theory of the selection the map projections in the mathematic cartography this selection for the most classes of maps (except the unified systems) was not implemented in the software. As a result when you want to develop the new kind of map you have to take the projection of the original cartographic material (map) or any of projections which offer the software.

Therefore of automated selection and construction of elements for mathematical basis of maps is now a priority of research in cartography, the important tasks of a competent and operational development of maps.

On geographic maps to a scale of 1:1 000 000 scale is determined by a given precision, but on a smaller scale maps of the most important is the content map, which is determined by the density of map objects. In this regard, developed mathematical apparatus for computing scale of mapping based on density map objects to maps created by cartographers or format of map.

Significant results have been achieved in solution of the task of choosing the optimal map projection for developed maps based on traditional factors considered and the generalized criterion of distortion of map projections.

In the construction of the graticule on small-scale maps suggested the optimal ratio of its frequency, scale of mapping and geographical mapping area.

Developed and tested a method of the computer-aided process of an arranging model, using mathematical tools selection of map objects and formed a cartographic database scale 1:8 000 000. This provides creation of an arranging model for maps of scale 1:1 500 000 and smaller.

After determining the elements of the mathematical basics that created by digital map bases is necessary to convert the content of the map database at any given scale. This is done by the developed method of automated selection of map objects.

For realization of the quantitative aspect of the selection process, a mathematical device for calculation of density index of cartographic objects was created. It allows you to determine the total number of settlements and set the overall length of the roads and rivers in the mapping of the territories of Russian Federation sub-federal units. Besides the ranking of mapping objects according to the degree of importance basing on identification codes of the objects takes place. We have developed a special program of mapping objects ranking for this; it also helps to decide a quantitative part of the

selection. The qualitative part of mapping objects selection carries out in an interactive way.

The developed methodology and technology of converting the database contents were tested in a number of variously-scaled maps of the Russian Federation sub-federal units. The comparison of the created and the traditional maps showed good agreement on quantity and composition of objects.

3. Conclusion

This development will provide not only the development of basic and derivative digital mapping frameworks for different areas of the Russian Federation in a given scale, but also will allow to use them for the development of thematic and special maps. It gives the opportunity to give up the search for a suitable traditional map of a required scale for using as a basic mapping material. For the thematic and atlas mapping need to automate the following processes:

- a choice of the method of cartographic display of the thematic information;
- calculation of graphic variables;
- development of a scale;
- development of cartographic symbols;
- coordination of the graphics load thematic and General geographic objects.

The steps of this technology were brought into effect in a special software complex. This complex provides automation of the processes of creating all the elements of the mathematical and cartographic bases

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